

The logo for the Northwest Advanced Renewables Alliance (NARA) features the letters "NARA" in a white, sans-serif font, centered within a dark gray rectangular box. A thin red horizontal line is positioned directly beneath the gray box.

Northwest Advanced Renewables Alliance

A new vista for Green Fuels, Chemicals, & Environmentally Preferred Products

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Project Co-Director

Ralph Cavalieri

Associate Vice-President for Alternative Energy
Project Director

Washington State University

Northwest Advanced Renewables Alliance



The NARA Team

USDA NIFA Sustainable Bioenergy
Nov 17, 2016 in Washington DC





Alaska Airlines
ANDRITZ
Biomass ad Infinitum LLC
Catchlight Energy
CLH
Cosmo Specialty Fibers Inc.
Facing the Future
Forest Business Network
LLC
Gevan Marrs LLC
Gevo, Inc.
ICM

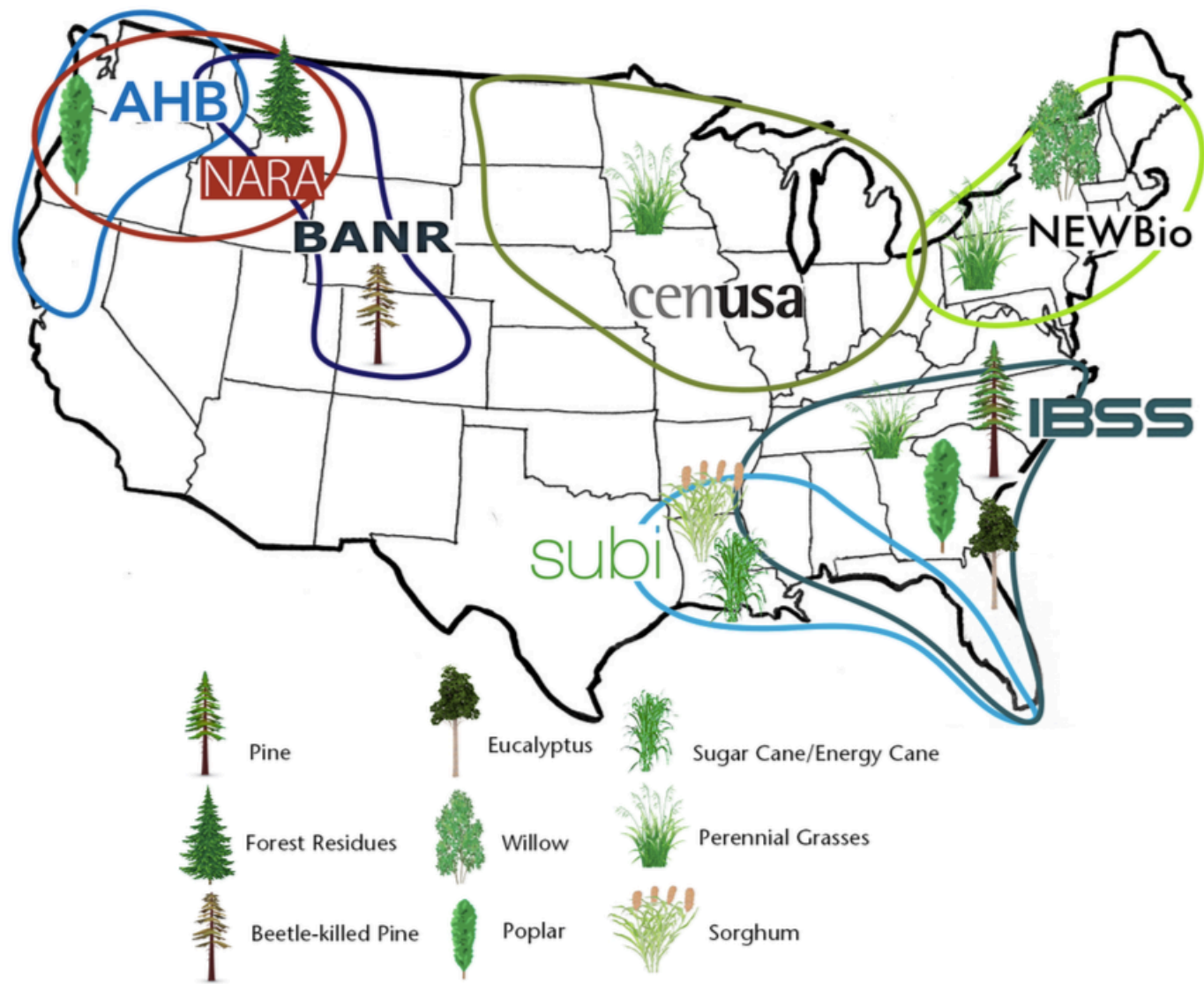
Montana State University
National Center for Genome Research
National Renewable Energy Laboratory
Oregon State University
Penn State University
Salish Kootenai College
South Hampton Resources Inc.
Steadfast Management Inc.
Thomas Spink Inc.
University of Idaho
University of Minnesota
University of Montana
University of Utah
University of Washington

University of Wisconsin-
Extension
USDA Forest Products
Laboratory
USDA Forest Service
Washington State
University
Western Washington
University
Greenwood Resources
Weyerhaeuser



USDA NIFA Sustainable Bioenergy AFRI CAP

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KEY

USDA
US Department of
Agriculture

NIFA
National Institutes of
Food and Agriculture

AFRI
Agriculture and Food
Research Initiative

CAP
Community
Agriculture Projects

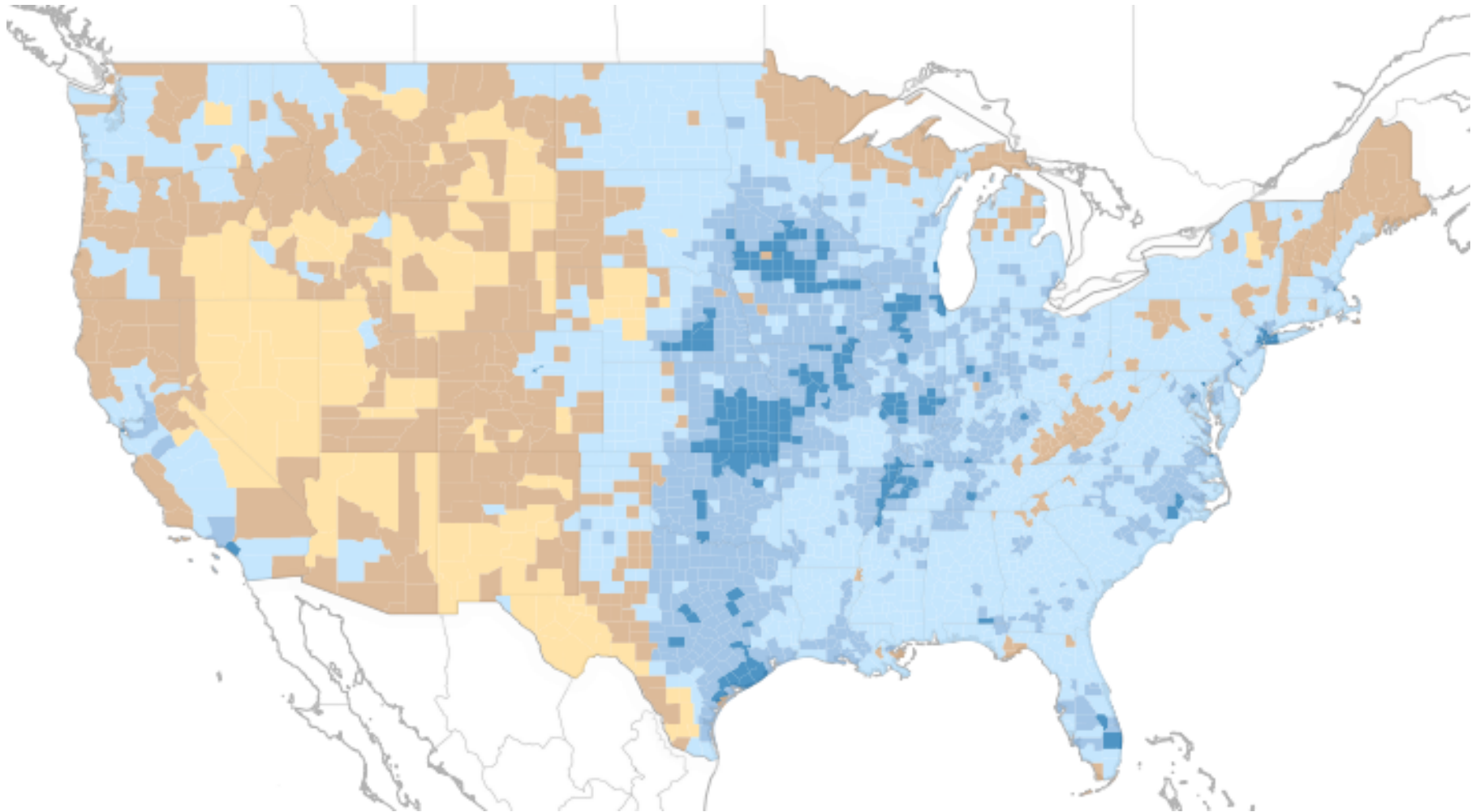
<https://goo.gl/vXAt2S>



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2016 Billion Ton Study – Biomass Density

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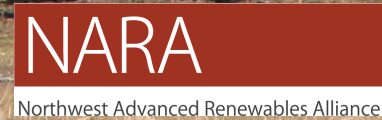
Sustainable BioJet
Valuable Lignin Co-Products
Rural Economic Development
Pilot Supply Chains
Energy Literacy
NATIONAL MODEL



Completed Year 5 of 5

Our Biomass Source

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Industrial Feedstock

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Biorefinery Approach

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Isobutanol to Jet Fuel Demonstration

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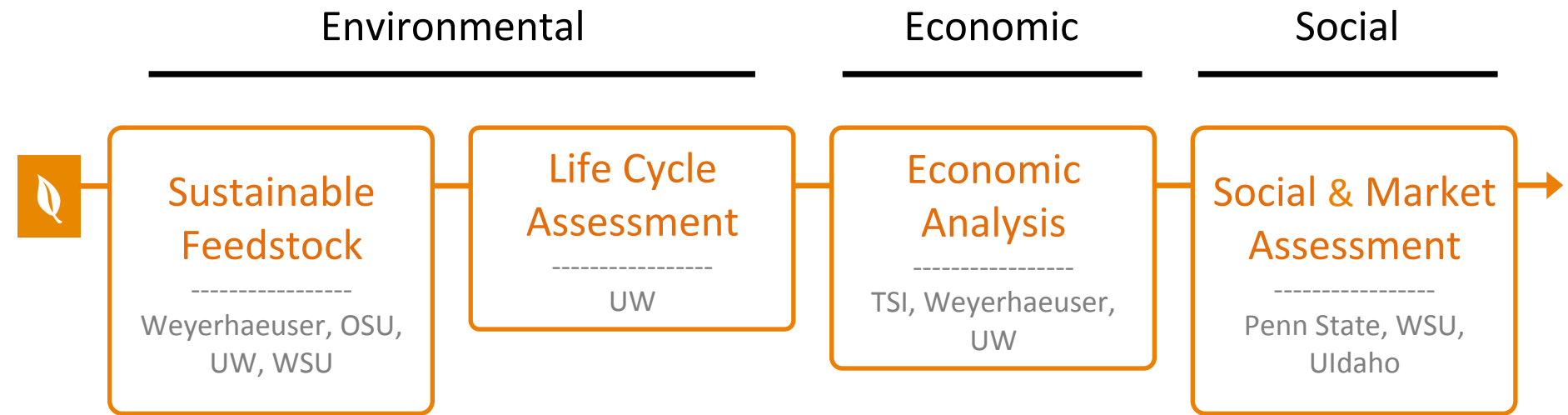
Demonstration unit at South Hampton Resources, Silsbee, TX is fully functional



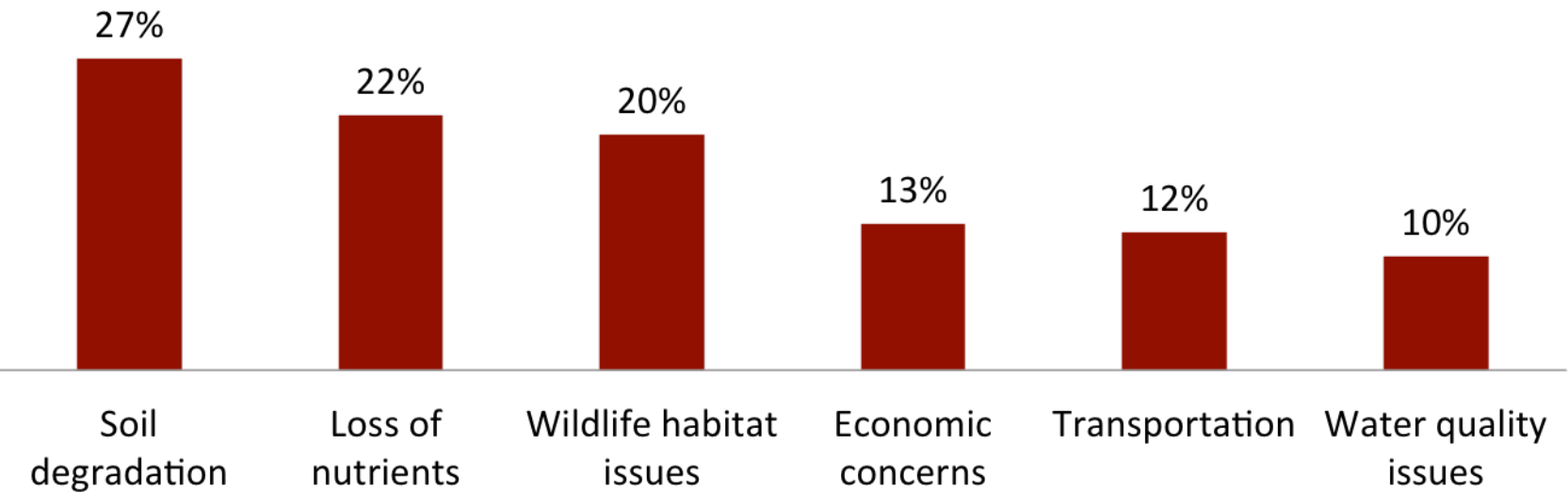
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Stakeholder Concerns



Final Form for Deployment

- Biomass Sourcing Model
- Biorefinery Siting Methodology
- ASPEN Process Model for Integrated Bio-refinery (IBR)
- Life Cycle Assessment Model (LCA)
- Community Impact Assessment (CIA)
- Techno Economic Analysis (TEA)
- Environmental Assessment Systems

SUSTAINABILITY ANALYSIS STATUS

READY TO SHARPEN THE PENCIL

Long-Term Soil Productivity

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Total Tree Removal

No Forest Floor

Bole only Removal



NARA

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Research Feeds Education

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Industry Feeds Education

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Education and Outreach Feeds Research

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Development Sites: Sustainability Criteria

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GREENFIELDS

- Non-industrial sites
- Wildlife habitats
- Agricultural land
- Resource land
- Ecological value



GRAYFIELDS

- Existing industrial sites
- No assumed contamination
- Community blight



BROWNFIELDS

- Existing industrial sites
- Real or perceived contamination
- Community blight
- Human health hazard
- Owner liability

Development Sites: Existing Assets

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SITE

Location, Infrastructure
Environmental permitting

EQUIPMENT

Operating Companies
Infrastructure

COMMUNITY

Workforce housing
Cultural and public buildings



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Regional Supply Chain Analyses



Pacific Northwest (PNW) [Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Pacific Northwest, which includes Montana, Idaho, Washington, and Oregon.



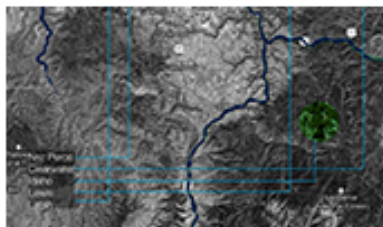
Mid-Cascades to Pacific (MC2P) [Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as Mid-Cascades to Pacific, which includes the western sections of Washington and Oregon.



Western Montana Corridor (WMC) [Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Western Montana Corridor, which includes the western section of Montana, Northern Idaho and northeast Washington.



Clearwater Basin [Supply Chain Analysis](#)

This site provides supply chain data and analysis generated by NARA research for the region identified as the Clearwater Basin, located in central Idaho.

A photograph of a forest landscape. In the foreground, there is a young evergreen tree growing from a pile of logs and debris. The ground is covered with dry, yellowish-brown vegetation. In the background, a dense forest of tall evergreen trees is visible, with a misty or foggy atmosphere.

OLYMPIC PENINSULA LIQUIDS DEPOT AND LIGNIN-BASED CO-PRODUCTS STUDY

Volume I | PRELIMINARY SCOPING

IDX Studio - Spring 2015

Northwest Advanced Renewables Alliance





Feedstock Suppliers

Weyerhaeuser Corp (OR)
Confederated Salish and
Kootenai Tribes (MT)
Muckleshoot Tribe (WA)

Processing Partners

Lane Forest Products (OR)
Forest Concepts (WA)
Kevin Jump (MT)
Bill Bass (WA)

Production Partnerships

Pretreatment

Andritz Corp
ZeaChem

Fermentation

ICM

Separation

WhiteFox

Alcohol to Jet

South Hampton Refining

1K-IPK – Fuel Distribution and Demonstration

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Fuel Certification

Alter Jet - ASTM D7566

Blending

Conv Jet – ASTM D1655

Distribution to Wing

Commercial Demonstration

Flight

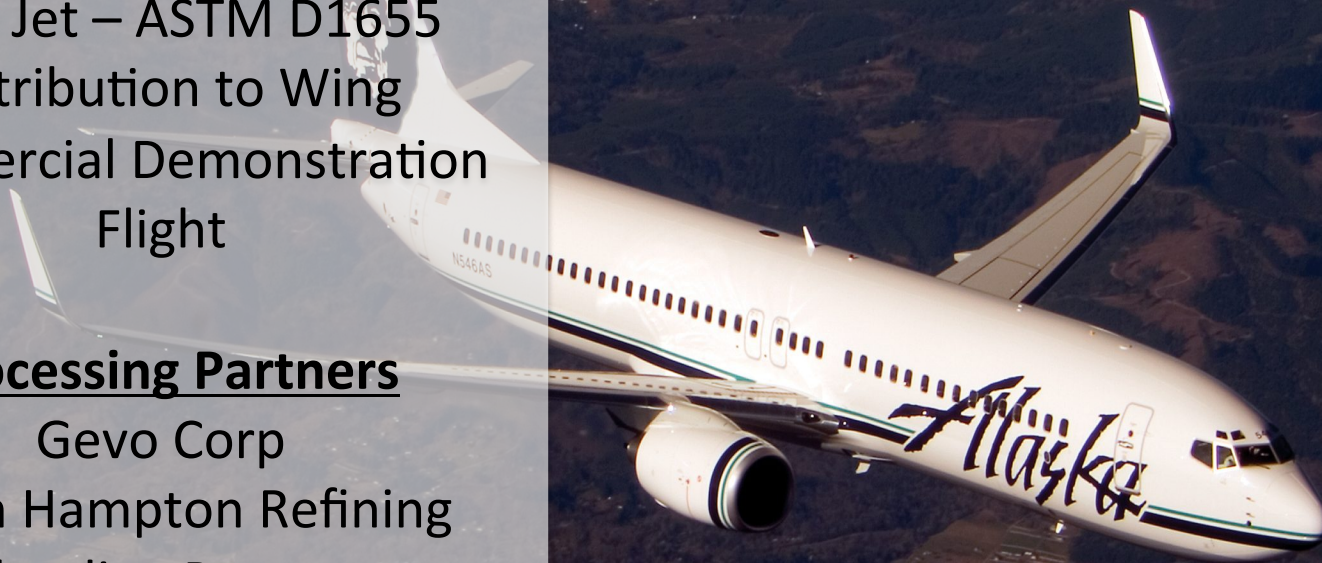
Processing Partners

Gevo Corp

South Hampton Refining

Blending Partner

Alaska Airlines



THANK YOU

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Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

